Chapter 1

A Review of the 1170 Andújar (Jaén, South Spain) Earthquake, Including the First Likely Archeological Evidence

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Additional information is available at the end of the chapter

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1. Introduction

The origin of the town of Andújar (figures 1 and 2), in southern Spain, is likely a Roman settlement, as suggested by certain archaeological evidence in its historical center (figure 2). Andújar was probably founded to control a significant strategic route on the edge of the Guadalquivir River and ending in Córdoba. The town was a flat settlement, without natural shelters, presumably defended in this epoch by a defensive wall or fortification, although no evidence remains of it.

The first clear reference to the defensive wall of Andújar is a request from the emir *'Abd Allah* to the governor of the region, in the year 888, asking for aid to fortify the fort of *Anduyar* (Andújar) to protect the population from insurgents opposing the government of the Umayyad dynasty [1]. Subsequent archeological evidences indicate this fortification was restructured and extended in different epochs.

Based on information gathered from various archaeological digs in the historical center of Andújar (figure 2), we propose the following construction stages in its walled compound.

a) The emiral-caliphal town walls (the word emiral comes from Emirate, and caliphal from Caliphate, the two political systems existing during this epoch). They were built in the 9th and 10th centuries, when the presumable early fortification was established and extended to protect the population of the region. After that time, Andújar became one of the main towns in the countryside of Jaén, in the Guadalquivir Basin, significantly increasing in population,

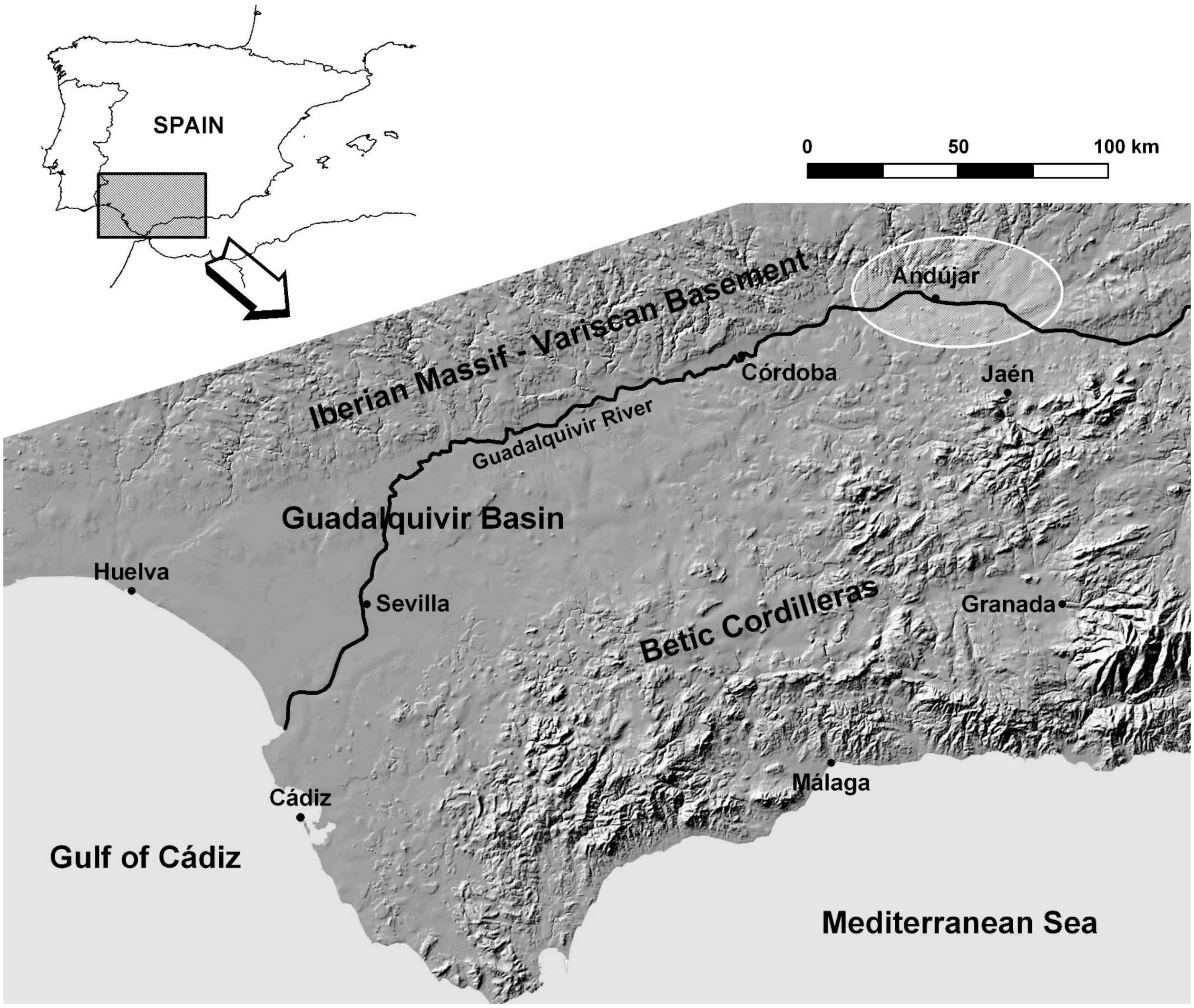

Figure 1. Regional setting of the study region. Ellipse shows the likely epicentral area of the Andújar earthquake.

and acquiring the condition of *Iqlim* (administrative district). The wall system is documented in an excavation carried out in the north of the town (figure 2) and revealing the ruins of a trapezoidal turret and several mud-walls of mortar with solid towers [2,3]. This mortar is extremely compacted gravel and lime, primarily white.

b) The taifa-Almoravid ramparts (taifas were small kingdoms in *Al-Andalus*, and the Almoravids were a Berber dynasty invader of Iberia, like the Almohads). During the 11th and the first half of the 12th centuries, the previous wall system was rearranged to incorporate the suburbs (recycling part of the obsolete emiral-caliphal walls) and thereby improving the security of the defensive system. These extensive works are an indication of the strategic nature of Andújar. Some ruins of the walls from this period have been documented in an archeological survey in the south of the town (figure 2). It includes a set of fortifications around one of the main gates of the city wall, the so-called *Puerta del Alcázar* (Alcazar gateway), the gateway for those entering town from the *Puente Romano* (Roman bridge). In this stage, the wall system was

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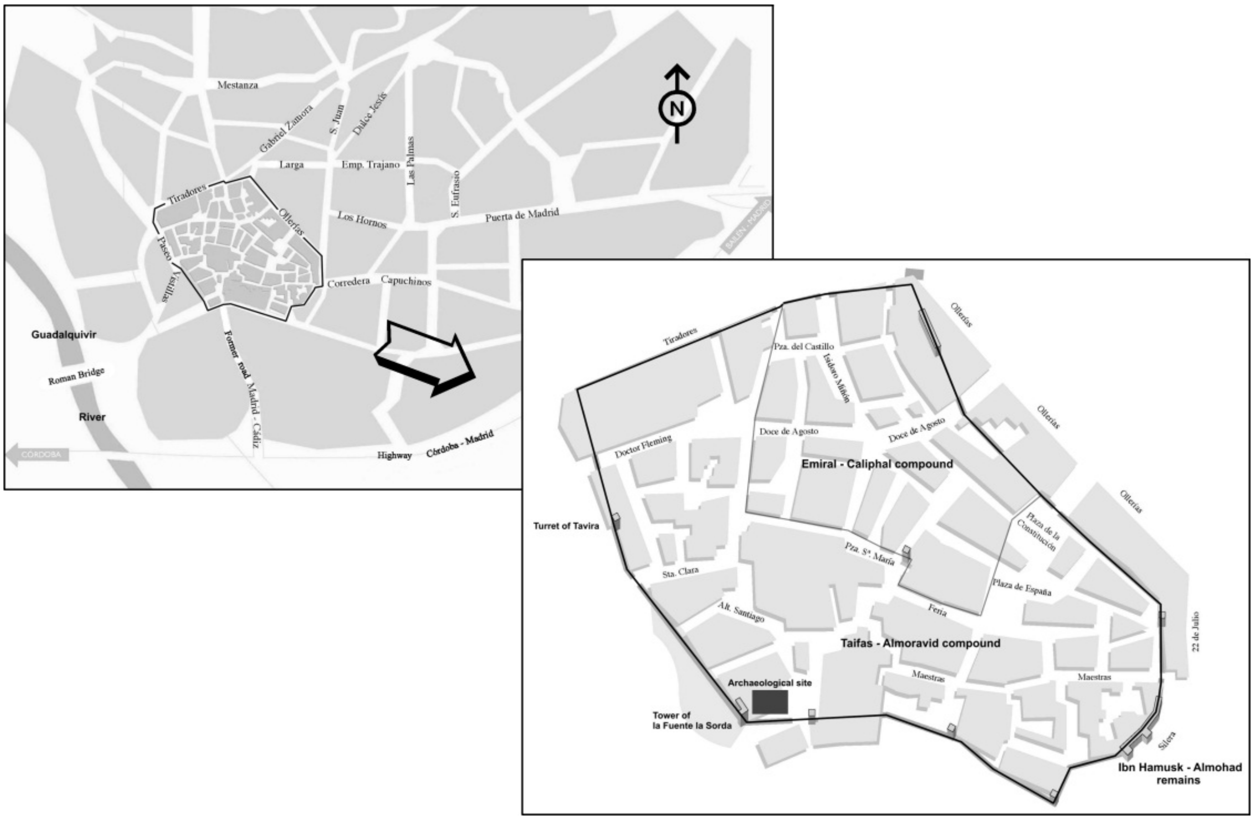

Figure 2. Current Andújar map. Historical center is enhanced showing the approximate extent of the different stages of ramparts and location of the archeological dig.

formed by mud-walls composed of small stones and lime in the externalmost part, and a mixture of materials inside, primarily dirt [4].

c) The *Ibn Hamusk*-Almohad stage (*Ibn Hamusk* was an insurgent who governed the region in agreement with Almoravids and Almohads, according to his interests). This was the most significant rearrangement of the wall system, carried out in the second half of the 12th and the beginning of the 13th centuries. Most remains discovered in the town are from this epoch [2,3]. Built structures at this stage are very homogeneous, constituting strongly tamped mud-wall made with lime, small stones, and sand. It is similar to those used in other fortifications in the northern Guadalquivir Basin (*e.g.*, Baños de la Encina, Giribaile and Santa Eufemia castles). In the northern sector of this wall system, in the most strategic spot, an alcazar (citadel) was built, which lasted until the beginning of the 20th century [5]. We are confident that this extensive rebuilding arose due to the deplorable conservation of the defensive wall system after the town was besieged and attacked various times in the second half of the 12th century and specially as a result of damage after the 1170 earthquake [6].

d) Christian stage or consolidation phase. Andújar was reconquered in 1225 by *Ferdinand III of Castile* and until the 15th century the ramparts were lightly repaired numerous times. Works mainly focused on cladding the most important structures of the defensive system, basically the towers and gateways, with sandstone ashlar. There are scarce elements remaining from this epoch, with the *Turret of Tavira* and the *Tower of 'de la Fuente la Sorda'* being worthy of note (figure 2) [5].

As mentioned above, after the taifa-Almoravid improvement and enlargement of the defensive wall system, a moderate earthquake struck this region. In the most recent Spanish earthquake catalog [7], it is termed the 1169, Andújar (Jaén) earthquake, the most destructive shock known in the whole Iberian Peninsula until the 1396, Tavernes de Valldigna (Valencia) earthquake (VIII-IX, macroseismic M_W 6.7) [8]. In the international scientific literature, the earthquake is known as the 1170, Córdoba earthquake [9]. This is due to the fact that these authors used only one of the contemporary manuscripts to catalog the event (ms. number 1 in Appendix), where Córdoba city is cited because it was much more important than Andújar and only 65 km away. In fact, Córdoba was the capital of the Emirate (750-929) and Caliphate (929-1031) of Córdoba, seat of emirs and caliphs. In the caliphate epoch, Córdoba reached a population of about 400000 inhabitants [10].

Although there is scarce information about the true effects of the earthquake, as we will see below, there is no doubt that there was a heavily damaging to destructive earthquake in Andújar. Moreover, in this paper we present what we consider to be the first archeological proof of this earthquake after interpreting the results obtained at an archeological site in the town. In archeoseismological studies, scientists must work bearing in mind the old rewrote saying: the presence of evidence is not evidence of presence. Considering contemporary documents of the event together with what we presume to be a recent archeoseismological result, we argue that in this case archeology supports the occurrence of this event.

This historical earthquake should be taken into account for future seismic hazard assessments in this region. If there is a moderate earthquake in an area, then there is a geological structure, known or unknown, that hosted it. Therefore, it is capable of being triggered again in future.

2. Contemporary written sources — Estimating effects and size

Three Arabic documents are the contemporary documentary evidence reporting the effects of this earthquake. They are two original manuscripts and a clear plagiarized summary of one of them providing no further information.

The best-known manuscript is that written by *Abû l-Walîd Muhammad Ibn Ahmad*, known during his lifetime as *Ibn Rushd* (the grandson), and later known in European literature as *Averroes*, a very important Andalusian philosopher and physician, among other activities. The text (ms. number 1 in Appendix) is included in his work *De Meteoris*, where the author revises different Aristotelian concepts. It must be taken into account that this text is not in fact a historic description of the incident, as in the other two manuscripts.

This is the only text considered in the historical seismicity works including this shock in references [9,11,12]. In reference [9], authors place the epicenter at Córdoba, assigning it a felt intensity (MM scale) equal to X. In contrast, in reference [12] authors place the epicenter at Andújar, assigning it a felt intensity (MCS scale) equal to IX.

It is important to note, as he states in his manuscript, that *Averroes* did not feel the mainshock himself, but several aftershocks when he went back to Córdoba from Sevilla. Concerning effects, it appears clear after reading the manuscript that: *a)* there was destruction and deaths, and *b)* there were aftershocks for three years. In addition, some statements suggest that the meisoseismal area, and presumably the epicentral area, is east of Córdoba, in the region of Andújar: *a)* effects were stronger east of Córdoba, and *b)* there were reported seismogeological effects in Andújar (*i.e.*, ground failure and/or ground liquefaction).

The second Arabic manuscript referring to this earthquake was written by *'Abd al-Malik b. Muhammad b. Ibn Sāhib al-Salā* (ms. number 2 in Appendix), an Arab chronicler contemporary of the event, and known by his translators for his explicitness, precision and fluency with respect to historical descriptions [13]. It is not totally clear but, it seems that *Ibn Sāhib al-Salā* was accompanying the caliph *Yūsuf I* and his brother the prince *Abū Sa'īd* on a journey throughout *Al Andalus*; accordingly, he probably felt the main quake or the aftershocks. In his manuscript, referring to events in the year 565 of the Arab calendar (September 25th, 1169 to September 13th, 1170), *Ibn Sāhib al-Salā* dramatically relates notable effects in Andújar: *a)* significant destruction, and *b)* a mainshock felt over a large region (the whole of *Al-Andalus*, and specifically in Córdoba, Granada and Sevilla).

The manuscript by *Ibn Sāhib al-Salā* has been selected to assign a date for this earthquake. He provides a detailed description for each year of the most important historic events in *Al-Andalus*. It is precisely this systematization in the timing of the related events that leads us to consider this date (January-February, 1170), as previously considered by the author in reference [14].

There are only two known works written by *Ibn Sāhib al-Salā* and only the second one, specifically the second volume of three of the second opus, called *Almohad caliphate history*, is currently preserved nowadays (in the Bodleian Library). This volume, which includes the manuscript referring to the Andújar event, covers 1159 to 1173. The only things known concerning the life of *Ibn Sāhib al-Salā* is what he relates about himself in this manuscript.

Further support as to the importance of this text and its chronicler, as stated in reference [13], is the fact that another contemporary historian, *Ibn 'Idārī*, copied and extracted literally (ms. number 3 in Appendix) the *Ibn Sāhib al-Salā* writings. Although it must be taken into account that the information in a derived source cannot always be considered confirmed information, in this case we agree with the author's [13] criterion.

Apart from these texts, there is no evidence of more reliable chronicles related to the event. A very short text (ms. number 4 in the Appendix) included in the so-called *Anales Toledanos* (Annals of Toledo), transcribed and compiled in reference [15], is the only other one worthy of note. They are contemporary medieval chronicles, characterized by extreme brevity and conciseness, reporting the most important occurrences of the time.

Some researchers in the Spanish historic seismicity consider that this citation likely refers to the Andújar earthquake [7,16], inferring that the quoted date is just the date of the event. In fact, as mentioned, in the recent Spanish earthquake catalog it is identified as the 1169, Andújar earthquake. Although it is quite possible that the Andújar earthquake was felt in the center of the Iberian Peninsula, we cannot guarantee that this sole reference in the *Anales Toledanos* can be taken as definitive proof for considering them to be the same event.

Evidently, the scarce documentary sources of this earthquake are a real problem in accurately dating the event. This lack also prevents researches from estimating with greater detail effects on buildings and people, establishing the meisoseismal area, and determining its impact on the society.

In a recent and comprehensive work [7], used as a basic historic seismic catalog in seismicity and seismic hazard studies in Spain, it is catalogued with a maximum intensity equal to VIII-IX (EMS-98 scale, used henceforth; [17]). As mentioned, it appears that there was ground liquefaction, implying at least a degree of intensity VIII. Nonetheless, this value must be supported independently of other effects. The intensity IX is sustained by the presumed effects on buildings, the result of considering that many houses were destroyed or collapsed and that many people died. Using the EMS-98 scale, this implies that many buildings of vulnerability class A (masonry structures of rubble stone, fieldstone, or adobe) sustained damage of grade 5 (total or near-total collapse). Quoted effects concerning mosque minarets described by *Ibn Sāhib al-Salā*, or damages in the ramparts, described below, as is well known, are very difficult to use for intensity assignment due to their complex structure and irregular behavior during an earthquake.

Using the empirical relationship among intensity and surface magnitude for the Mediterranean area in [18] gives M_S 6.0 ± 0.6 for this shock. In this estimate, evidently, possible site effects are not included.

An unpublished geophysical exploration test recently carried out by the authors in an alluvial terrace at the same level as Andújar using the H/V spectral ratio approach based on ambient vibrations, showed resonance frequencies in the range of 5-8 Hz, clearly related to very shallow structures, specifically a shallow sandy sedimentary layer. The potential amplification of earthquake motion by sediments in this area, using this or other approaches, must be explored in depth by future projects. Potential site effects in Andújar are expectable, increasing the seismic hazard in this location, but presumably decreasing the afore-mentioned expectable magnitude for the Andújar earthquake.

There are four fluvial terraces and the present flood plain in the Andújar area, with elevations above the river channel on the order of 55, 25, 13, and 6 m, from oldest to youngest [19,20]. These terraces comprise alluvial sediments from the Guadalquivir River with thicknesses ranging from approximately 5 to 10 m. They show a conglomeratic lithology with a silty mud-matrix that becomes sandy mud-matrix at the top of each terrace level. In general, the lower part of the terraces portrays the channel infilling and bar bedform, and the upper part shows the alluvial flood plain. The ages of these terraces range from the Holocene to 600 ka.

3. Seismic and geological framework

The only shock that stands out in the area is the studied earthquake. Seismicity is very scarce near Andújar, which is characteristic of the northern Guadalquivir Basin. Even within the basin, only a few minor earthquakes ($4.0 \leq M \leq 5.0$) are located. This region is therefore considered to have a low seismic hazard [21]. In fact, the design acceleration (called basic acceleration) for a return period of 500 years in the Spanish building code [22] for Andújar is only 0.05g.

The work in reference [21], using the spatially smoothed seismicity approach, includes a model with the most significant earthquakes in the Iberian Peninsula over the last 300 years. On the other hand, the design acceleration considered in the Spanish building code was computed through a typical zonified method using a broad seismic zone including the whole Guadalquivir Basin. Neither of these two assessments properly included the 1170 Andújar earthquake.

The only instrumental shock in this region deserving of mention is the March 10th, 1951 Linares earthquake (M_D 4.8, VIII), 25 km NE of Andújar [23]. In a recent work [24] this event is reevaluated (M_S 5.4, VI-VII, h = 30 km) and relocated to 20 km ESE of Andújar. These authors host this event at the base of the crust, in some deep fault near the southern boundary of the Paleozoic Iberian Massif related to the bending of the Paleozoic basement under the Neogene Guadalquivir Basin. More recently, in [25] has been reevaluated this earthquake once again (M_W 5.2, h = 20 km), relocating it to 70 km SSW of Andújar (*i.e.*, distancing it from Andújar). In this last work, the authors cannot explain the known macroseismic intensity distribution for this event after the epicenter relocation. Neither is a tectonic origin proposed.

The presumed mesoseismal area of the Andújar earthquake (figures 1 and 3) involves three tectonic and geographic domains (figure 3). The first, just north of Andújar, is the Paleozoic Iberian Massif, structured during the Variscan orogeny. The Iberian Massif has a flat topography, with the exception of its southern edge, which has a smooth slope.

The second domain is the Guadalquivir Basin, which is a classic foreland basin [26] formed by the collision of the Internal Zones of the Betic Cordillera with the southern paleomargin of the Variscan Iberian Massif. The Andújar area is located on the north side of the basin, at the piedmont of Sierra Morena. This range, along the Variscan border, has recently been interpreted as a flexural fore-bulge formed by the overload of the Betic chains above the Iberian crust [27].

The third tectonic domain is the frontal thrust belt (Subbetic and Prebetic) of the Betic Cordillera, which delineates an evident mountain front 40 km south of Andújar, a result of the aforesaid continental collision.

The most active stage of the continental collision occurred in the region between 20 and 7 Ma ago (Burdigalian-Tortonian) [28]. Nevertheless, there is clear evidence of recent tectonic activity along the Betic Mountain Front [29,30] that may account for its limited seismicity. This tectonic and regional seismic activity is probably related to the ongoing Africa-Iberia collision, with a convergence rate of 4-5 mm/year [31]. However, the Andújar region and the Betic

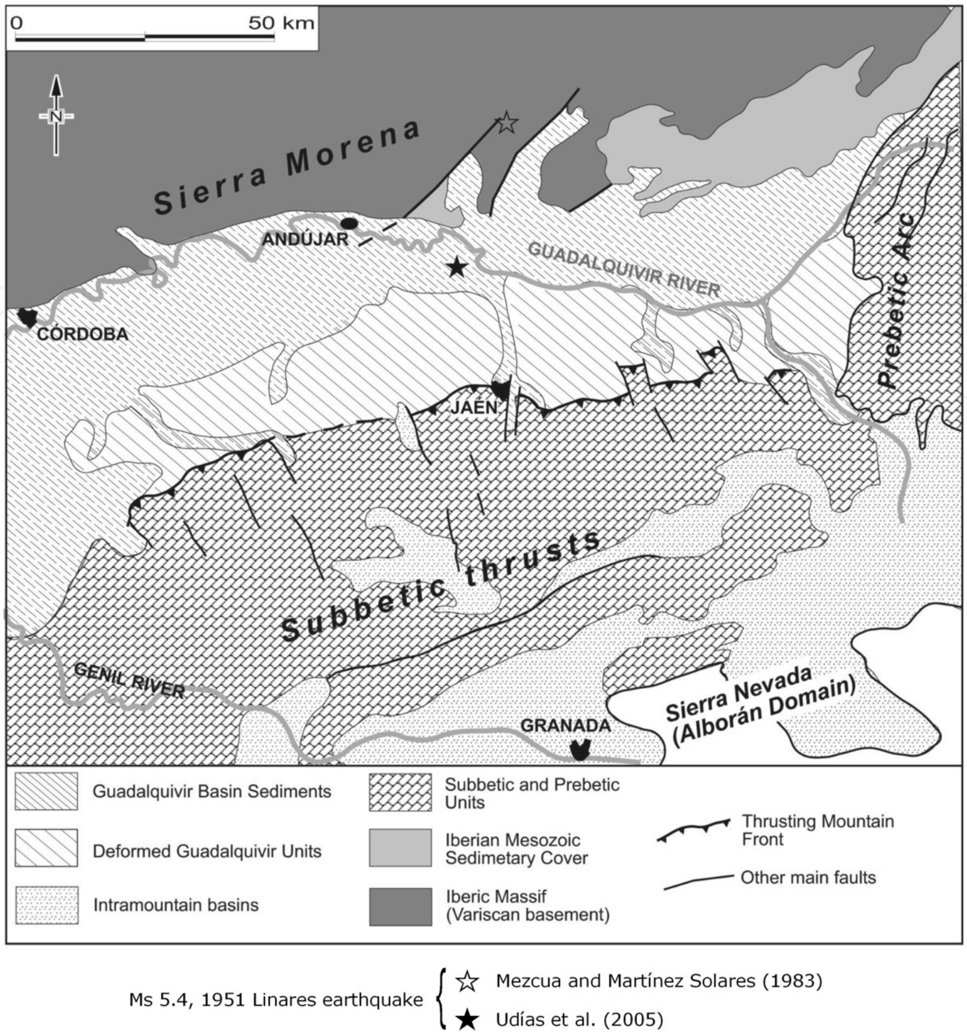

Figure 3. Tectonic sketch of the study region.

Mountain Front are relatively far from the current plate boundary. On the other hand, the Betic thrusts in the area are relatively shallow and detached from the Variscan Basement through the plastic Triassic materials (Keuper). Keuper sediments are rich in clay and gypsum, displaying very plastic behavior and lacking enough strength to accumulate a large amount of stress. Nevertheless, active Betic thrusts can account for small shallow earthquakes along the Betic Mountain Front [30].

Other tectonic structures near Andújar capable of accumulating enough stress to trigger moderate earthquakes, or at least displaying geomorphologic evidence of recent tectonic activity must also be considered. One possible source of the 1170 earthquake is the flexure of the entire lithosphere. It can cause moderate to strong earthquakes [32], but only from the beginning of the orogenic overload (Lower Miocene) until viscoelastic stress relaxation and equilibrium was reached, a few million years ago [33]. However, the present intraplate compression could lead to the amplification of the initial flexural foreland loading [34,35] and consequently the reactivation of seismic faults.

Another plausible seismic origin are the faults that fragmented the south Iberian crust during the Mesozoic, creating several blocks that produced swells and troughs in the marine paleomargin [36]. These faults and their lateral ramps were tectonically inverted during the build-up of the Betic Cordillera (Miocene compression) and reutilized mainly as thrusts [37] until nowadays [38]. Thus, they continue to comprise crustal weak zones locally focusing the present crustal stress to host moderate earthquakes [30]. Most of these faults, seemingly with low slip rates, are now covered by the Guadalquivir Basin sediments (figures 1 and 3) and are difficult to recognize, even by geophysical exploration methods [39].

No Quaternary active faults have been described until now in the region and no clear limits can be traced at the lithospheric scale that could cluster the stress in the area. Nonetheless, any of the faults of these systems could explain a M_S 6.0 earthquake such as the Andújar event. Further work should look for active faults bordering rigid crustal blocks of the Variscan basement accommodating some of the present convergence between the Africa and Iberia plates.

4. Archeological evidence

A recent unfinished archeological survey in the south of Andújar, as previously mentioned, has revealed the ruins of a fortification that underwent rebuilding (figure 4). We presume that these repairs are related to the 1170 earthquake.

Figure 4. Current general view of the archeological site.

This archeological dig proves the existence of an early alcazar built in the 11th century, in the taifa-Almoravid stage, used approximately until the first half of the 12th century. In this epoch, it was replaced by a new alcazar located in the northern part of the town, built in the second half of the 12th and first half of the 13th centuries. After this, the early and obsolete alcazar was used only as a guard gate and control point of one of the main gateways (figure 5).

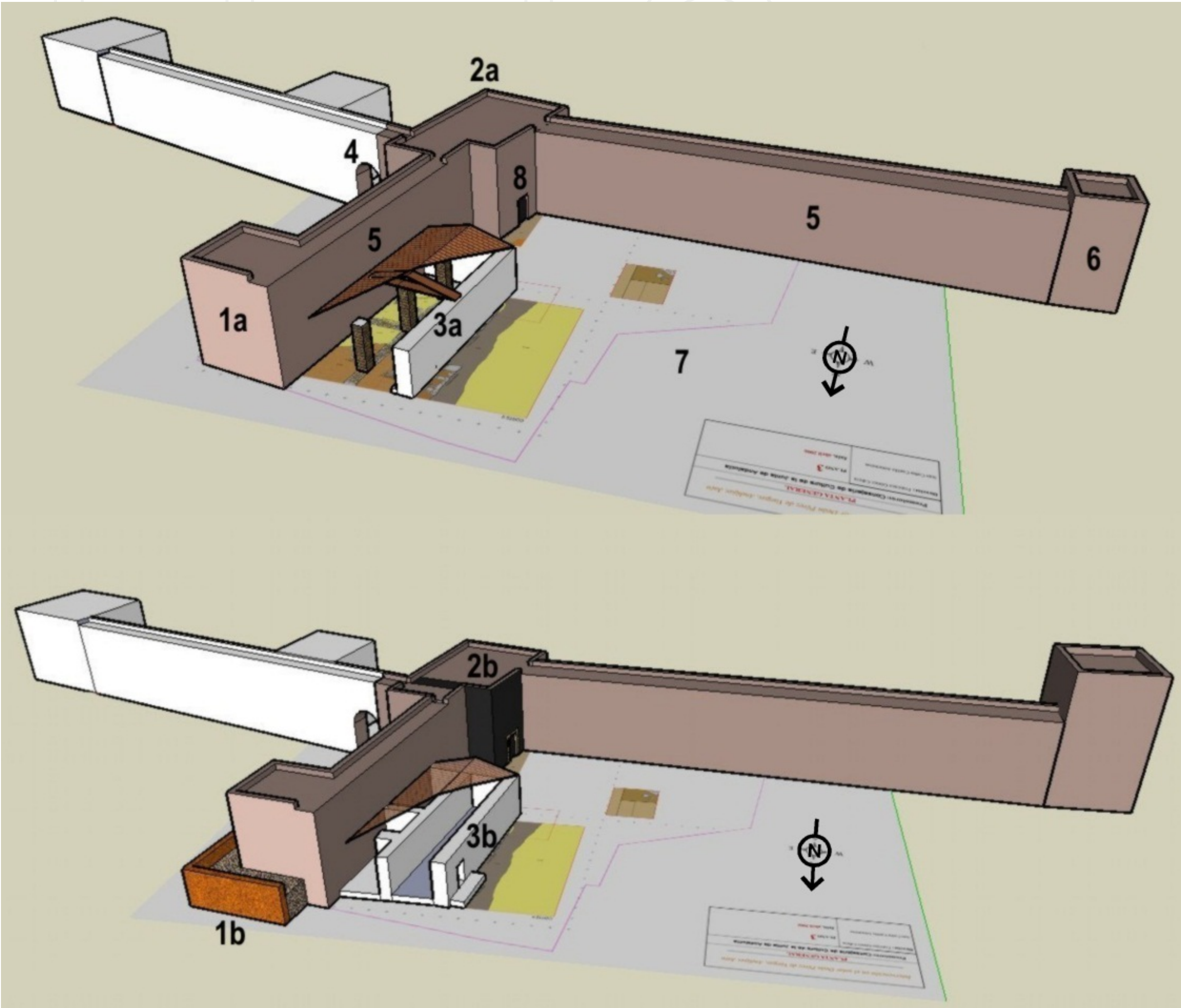

Figure 5. Reconstruction of the taifa-Almoravid (top) and *Ibn Hamusk*-Almohad (bottom) remains in the archeological site. 1a. Northern square solid tower. 1b. Reinforcement at the foundation of the tower. 2a. Southern complex tower. 2b. Reconstructed northwestern corner of tower. 3a. Rectangular building with adobe pillars. 3b. Reconstructed building, now including a dividing wall. 4. Gateway (Alcazar gateway). 5. Ramparts. 6. Western tower. 7. Courtyard. 8. Tower gate.

The defensive walls and towers of the early alcazar were built using a matrix of lime, sand, and small stones outside, and dirt and rubbish inside. This construction technique is unquestionably quick and cheap. However, although fillings of dirt and rubbish involve lower cost they also entail structural weakness, particularly for ground shaking during earthquakes. Two towers were excavated during the archeological survey, a small solid square tower to the north and another more complex one to the south (figure 5). This second tower had a room inside with a flat roof connecting the wall walks.

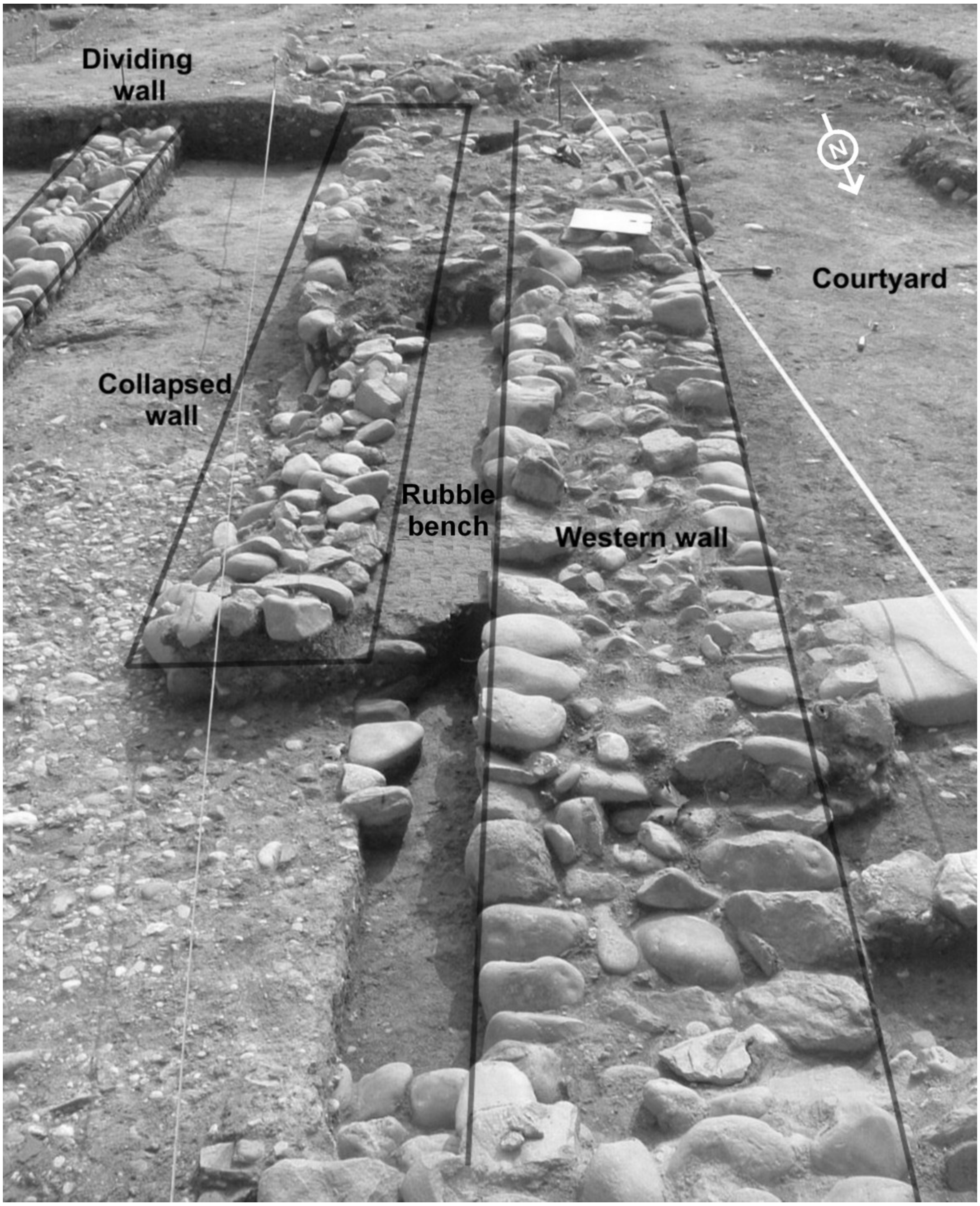

Figure 6. Details of the rectangular building within walls (3a and 3b in figure 5). Ordered fallen blocks of the collapsed wall are visible over the rubble bench.

Inside the alcazar, there was a large courtyard or ward where a simple rectangular building was probably used as a storehouse and/or kitchen (figures 5 and 6). The fact that it is not decorated suggests that it was not a room belonging to a palace or a residence. This building, attached to the eastern rampart, is 6.15 m wide, with an ashlar wall 1 m wide parallel to the rampart. The total length of this building is not completely known at the moment because the ends have not yet been excavated. Inside the building were found adobe pillars in a central position, probably related to the inward division and the roof support. Also, a rubble bench attached to the ashlar wall. The building was likely a space without interior walls divided into two rooms separated only by central pillars. These pillars held up central beams forming part of a roof of wood and tiles.

The 1170 earthquake affected (figure 5) both the fortification and the attached building, as we show below.

The northern tower was heavily damaged. In fact, later reinforcement of its foundation can be observed (figure 7). The reinforcement was made by means of a wall of tamped dirt 0.4 m wide and 1.1 m high surrounding the tower at a distance of 1.6 m. The space between the tower and the wall was filled in with cobblestones, two layers of dirt, and another of adobe. At present, the reinforcement can be clearly seen only in the southern part of the tower, but it apparently bordered the entire tower. Thus, the final surface of the tower was quite extended.

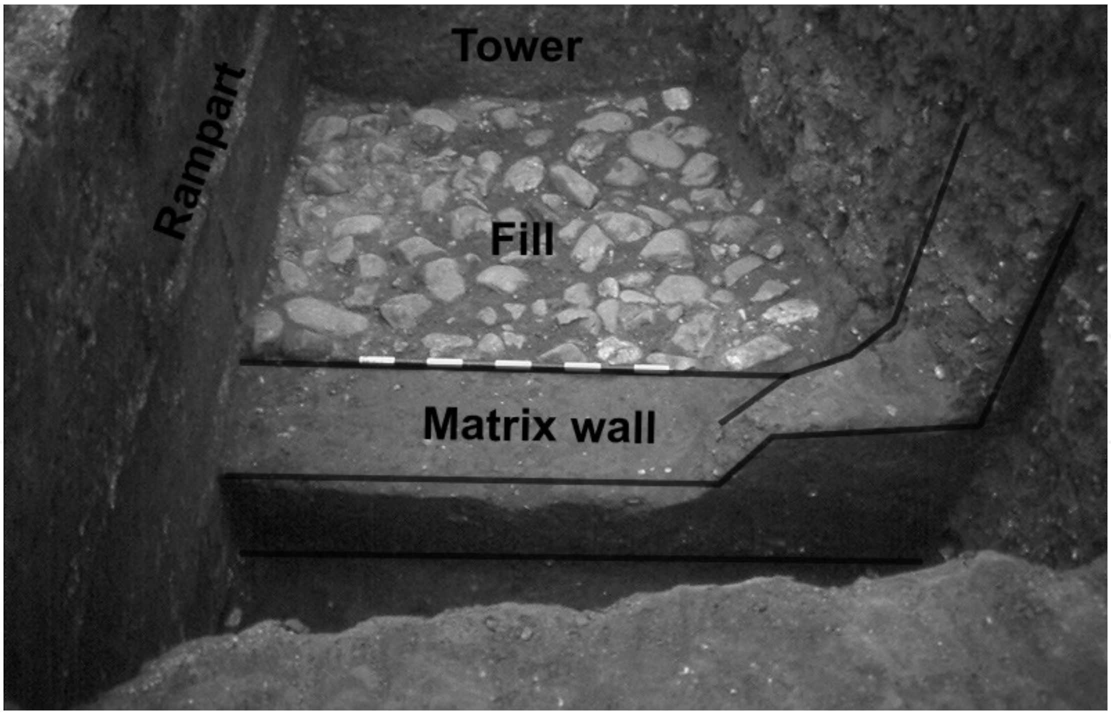

Figure 7. Detail of the uncovered reinforcement at the foundation of the northern tower (1b in figure 5).

The southern tower (figures 8 and 9) was also damaged. Specifically, its northwest corner was destroyed, likely the weakest part due to the opening of the gate. It was repaired, replacing the mud-wall by a tamped dirt wall, remodelling and decreasing the room inside it. The remodelled tower shows support with medium-sized rocks, barely preserved.

Figure 8. Details of the southern complex tower (2a in figure 5) showing the reconstructed corner. View from the courtyard.

The rectangular building inside the alcazar underwent near-total collapse (figure 6). The archeological dig found that the unattached western wall (1 m wide) of this building toppled inwards, to the east, and the fallen blocks are aligned the length of the wall. Fallen rocks tumbled on the rubble bench attached to the wall and on the floor. After the collapse, instead of cleaning out the blocks to the original floor, only a shallow cleaning was made. Therefore, collapsed blocks were buried, raising the level for a new floor. Moreover, previous pillars, likely very damaged or collapsed, were replaced by a dividing wall parallel to the fortification and to the front. From this dividing wall, the room was partitioned into four compartments after its reconstruction.

Figure 9. Details of the southern complex tower (2a in figure 5), showing the reconstructed corner. Opposite view of figure 8. 1. Early taifa-Almoravid wall and tower. 2. Reconstructed Ibn Hamusk-Almohad tower. 3. Christian period.

Some authors have used ordered fallen blocks as seismic-related kinematic indicators [40,41], among others effects, in order to determine, for example, the direction of seismic wave propagation or the degree of seismic shaking. In our case, the occurrence of just one episode unfortunately does not allow any conclusions to be inferred.

Since that time, this defensive complex likely had other functions, mainly as dwellings with rooms, kitchens, stables, and so on, as inferred from the archeological material found. This new use is supported by the fact that in the Almohad epoch, as noted previously, the alcazar was relocated to the northern part of the town, in a more strategic site [4].

Until now, these damages, reconstructions, and reinforcements could not be accurately dated. In any case, the fact that they occurred during the The *Ibn Hamusk*-Almohad stage (the second half of the 12th and the beginning of the 13th centuries), together with the documented date of the Andújar earthquake and the fact that no other likely historical explanation exists, supports a link between damages and the shock.

5. Summary and conclusions

In this paper we have presented a case study in seismic archeology that we believe to be the first likely archeological evidence of the 1170 Andújar earthquake. This case concerns one of

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the thorniest aspects of archeoseismology: to ascribe to historical attested earthquakes observed damages or effects in archaeological digs.

For this shock in southern Spain, only historical/documentary records have been available until now. Initially, a review of the scarce contemporary manuscripts was done, estimating some effects and justifying the presumed size. Then, damaged archeological structures and different repairs and reinforcements revealed in an archeological survey are proposed as true earthquake-related damages. In this case, in addition to the observed reinforcements and damages, there is the supporting evidence [42] of the historical record. We are confident that repairs and reinforcements in the two discovered and excavated towers, as well as the remodelling of a building attached to the rampart, including tumbled blocks along the length of its wall, are archeoseismological evidence. But it is still not possible from these effects to derive a better earthquake intensity estimate than that from contemporary manuscripts. In any case, we expect further results in future surveys, trusting that the site preserves additional traces of seismic activity in the ground.

The question still remains as to which geological structure hosted this shock. As discussed above, with no more plausible candidates, we suggest hidden faults bordering blocks of the basement as the most likely hypothesis.

Evidently, additional historical, archeological, and geological studies must be undertaken to estimate the size, effects and future implications of this earthquake.

Appendix

Manuscript number 1

author: *Abû l-Walîd Muhammad Ibn Ahmad*, *Ibn Rushd* (the grandson) or *Averroes*

source: *Taljīs kutub Aristātālīs fīl-Hikma*. Cairo National Library

transcription: reference [43]

used translation: references [12,44]

Anyone who saw with his own eyes the earthquake which occurred at Córdoba in the year 566 [September 14th, 1170 - September 3th, 1171] has received confirmation [of the Aristotelian theory of earthquakes]. I was not at Córdoba at the time, and when I arrived, I heard the rumble which preceded the earthquake; people thought the rumble came from the west. I saw the earthquake being generated by the progressive movement of west winds. These earthquakes persisted at Córdoba throughout the year, and only ceased after about three years. The first earthquake caused great destruction and killed many people; it was said that at a place near Córdoba called Andujira [Andújar], the earthquake caused the earth to split open and something similar to ashes and sand came out of the fissure. To the east of Córdoba the effects were even more violent, whereas they were slighter to the west.

Manuscript number 2

author: *'Abd al-Malik b. Muhammad b. Ibn Sāhib al-Salā*

source: History of the Almohad Caliphate. Manuscript number 433. Bodleian Library. Oxford University

used transcription and translation: reference [13]

In the same year, the rain for the laid fields in al-Andalus was delayed until the Christian month of December, 1169, and [then] it rained and people sown. In this year big earthquakes happened at dawn and when noon declined in the month of *Ŷumadā al-ūlà* in the year that we chronicle [January 21th to February 19th, 1170], and they continued in the Andújar town for several days, until it almost dissapeared, and it was swallowed by the ground, and they continued, after this, in the Córdoba, Granada and Sevilla cities, and all *Al-Andalus*, and the eyewitness saw that walls of the houses shaken and sloped towards the ground, then they straighten and return to its position by the goodness of *Allah*, and because of that a lot of houses were destroyed in the quoted regions, and the minarets of the mosques.

Manuscript number 3

author: *Ibn 'Idārī*

source: *Al-Bayān al-Mugrib*. Manuscript discovered in a Koranic school in Tamagrūt, near Zagora, in the Draa Valley (Morocco)

used transcription and translation: reference [45]

In this year, a big earthquake happened, at dawn and at the end of the month of *Ŷumadā al-ūlà*, in part of *Al-Andalus*; the eyewitness sawn that walls were shaken and sloped towards the ground, but then they straighten and return to its position by the goodness of *Allah*. A lot of houses and minarets were destroyed in the Córdoba, Granada and Sevilla cities.

Manuscript number 4

source: vanished codex

used transcription: reference [15]

Toledo was shaken on February XVIII, MCCVII [February 18th, 1169] [The quoted data in the text concern to the Spanish or Hispanic era, or Era of the Caesars, beginning in the year 38 B.C.].

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